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Nuclear Warhead “Pit” Production: Background and Issues for Congress

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Nuclear Warhead “Pit” Production: Background and Issues for Congress

Summary

A “pit” is the fissile core of a nuclear warhead. In modern warheads, it creates a nuclear explosion that triggers a substantially larger thermonuclear explosion. All pits currently in the U.S. nuclear stockpile were made at the Rocky Flats Plant near Denver, CO, which opened in 1952. The Department of Energy (DOE) halted pit manufacturing operations there in 1989; the United States has been unable to make stockpile-quality pits — and therefore complete nuclear warheads — since then.

Inability to make pits may have adverse consequences. For example: (1) The United States cannot replace pits for the W88 warhead (for the Trident II missile) that are destroyed during evaluation; currently, only one W88 evaluation pit remains, so use of more W88 pits would reduce deployable warheads. (2) Pits deteriorate over time, though the rate at which that happens is under study. If pits of a given type deteriorate so much as to be no longer reliable, or if an unanticipated defect arises, then hundreds to thousands of deployed warheads might have to be withdrawn.

The National Nuclear Security Administration (NNSA), which manages the U.S. nuclear weapons program, has a five-part plan to restore pit production capability: (1) Establish a small facility (PF-4) at Los Alamos National Laboratory (NM) to fabricate pits, initially for the W88. Los Alamos manufactured the first pit to stockpile standards in April 2003. (2) Develop procedures to certify W88 pits — to provide high confidence without nuclear testing that the pits will work as intended. NNSA expects that, in 2007, Los Alamos will be able to certify W88 pits that it makes. Only certified pits can enter the stockpile. (3) Conduct experiments (not nuclear tests) in support of W88 pit certification at the Nevada Test Site. (4) Conduct pit manufacturing and certification for other pits. (5) Plan a Modern Pit Facility (MPF) with a higher capacity than PF-4, to reach full operational capability in FY2021. NNSA estimates total cost at \$1.46 billion for items (1) and (2), smaller amounts for items (3) and (4), and \$2 billion to \$4 billion for item (5).

Congress has long shown interest in the program. It generally supports low-rate production at Los Alamos. It raised concern over budgeting and the pace of pit certification, but now praises NNSA for “turning around” the W88 pit program. On MPF, the FY2004 defense authorization act supported the Administration’s schedule. The appropriations act reduced funding; conferees stated that until Congress reviews nuclear stockpile plans, “it is premature to pursue further decisions” on MPF. MPF’s schedule to reach full operational capability slipped a year between 2003 and 2004.

Congress faces several issues as it considers the pit program. Is NNSA’s plan for certification reasonable? Does the United States need new pits (beyond limited quantities for the W88)? If so, what capacity is needed? Can PF-4 be expanded to build enough pits to avoid the need for MPF? Could MPF’s schedule be accelerated? Should its schedule be delayed?

This report is intended for those interested in the U.S. nuclear weapons program. It will track the pit budget request and program, and will be updated as needed.

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Nuclear Warhead “Pit” Production: Background and Issues for Congress

Background

U.S. policy since the mid-1950s has been to maintain a stockpile of at least several thousand nuclear weapons (active and inactive) for the indefinite future. The Bush Administration reaffirmed this policy in its Nuclear Posture Review, briefed to Congress in early 2002.¹ This report deals with an element the Administration views as necessary for continued maintenance of the stockpile, resuming production of “pits,” a key component of nuclear warheads.²

U.S. nuclear warheads include a primary and a secondary stage. The primary stage has a layer of chemical explosive surrounding a shell of fissile metal — all warheads in the stockpile use plutonium — and other components. Detonating the explosive compresses the fissile metal so much that it can sustain a fission chain reaction. The resulting nuclear explosion triggers a secondary stage, which through fission and fusion produces most of the warhead’s explosive yield. In the primary, the components inside the explosive make up what is called the pit. Of these components, the plutonium shell is by far the hardest to make. When completed, the pit is sealed to protect it from air and moisture.

From 1952 to 1989, Rocky Flats Plant, under the supervision of the Department of Energy (DOE) and its predecessor agencies, used industrial-scale processes to manufacture many thousands of pits for deployed weapons. All weapons now in the U.S. stockpile use pits made there. (Los Alamos and Lawrence Livermore National Laboratories fabricated hundreds of one-of-a-kind pits for nuclear tests.) Following a 1989 raid by agents of the Federal Bureau of Investigation and others to investigate suspected environmental, safety, and health violations,³ DOE suspended Rocky Flats’ pit manufacturing operations in 1989, and permanently closed these operations in 1992. Thus, since 1989, the United States has had no capability to build pits of the quality and quantity that DOE deems necessary for use in the stockpile. DOE stated in February 2004, “Today, the United States is the only nuclear weapons power

¹ For a discussion of this policy, see CRS Report RL31623, *U.S. Nuclear Weapons: Changes in Policy and Force Structure*, by Amy Woolf.

² For a more general discussion of nuclear weapons production, see CRS Report 98-519 F, *Nuclear Weapons Production Capability Issues*, by Jonathan Medalia. (Archived report available from the author.)

³ See Matthew Wald, “Grand Jury Seeks Inquiry on Weapons Plant Case,” *New York Times*, November 19, 1992: 16.

without sufficient capability to manufacture stockpile-certified plutonium pits required to sustain its nuclear arsenal.”⁴

The National Nuclear Security Administration (NNSA), a semiautonomous agency within DOE that Congress established in 1999, manages the nuclear weapons complex — the labs, plants, and test site for nuclear warhead R&D, production, maintenance, etc. It is thus responsible for restoring pit production.

NNSA holds that the inability to build pits could impair the nuclear stockpile, for reasons such as the following.

- Each year, NNSA monitors some warheads for defects. Most of these warheads can be put back into the stockpile, but a few undergo more extensive tests that preclude their reuse. These latter tests include destruction of pits. Therefore, when DOE built pits for stockpile weapons, it built some spares to replace pits expected to be destroyed over a warhead’s design life. Now, warheads are expected to remain in the stockpile far beyond their design lives. Unless new pits are made by the time spares are used up, tests that consume pits would force the removal of deployed warheads from the stockpile.
- Based on current data, NNSA anticipates that pits will last for decades, but will eventually deteriorate. If that proves to be the case, NNSA would ultimately have to replace all pits that remain in the stockpile beyond that time.
- Without replacement pits, if a type of pit develops certain kinds of defects, NNSA might have to withdraw from service all warheads using that pit.
- If NNSA designs new nuclear warheads in the future, it would probably need new pits for them. NNSA now stores thousands of pits from retired warheads. In theory, new warhead designs might incorporate stored pits. However, any aging problems would affect stored pits as well as deployed pits, so that NNSA cannot count on using existing pits in future warheads.
- The Nuclear Posture Review presents the Administration’s general policy guidance for nuclear weapons and related defense elements, including infrastructure. While it is classified, NNSA said that the review “stated that the ability to produce pits is important to ensure the future viability of the nation’s nuclear deterrent.”⁵

⁴ U.S. Department of Energy. Secretary of Energy. *National Nuclear Security Administration Report to Congressional Defense Committees on “An Enhanced Schedule for the Modern Pit Facility,”* requested by the United States Senate in Senate Report 108-46, pages 457-458. February 1, 2004, p. 3.

⁵ *Ibid.*, p. 1.

The National Nuclear Security Administration's Program for Pit Production

The Pit Manufacturing and Certification Campaign is NNSA's effort to restore pit production. Campaigns are "focused scientific and engineering efforts" whose goal is "to develop and maintain special capabilities and tools needed for continued certification of the stockpile, now and into the future, in the absence of underground nuclear testing."⁶ This campaign seeks to manufacture and certify one type of pit in the short term, restore the capability to build other pit types in the intermediate term, and build a higher-capacity manufacturing facility for the long term. This section discusses the elements of this campaign; "Congressional Actions," below, discusses congressional handling of this campaign. Table 1 presents estimated funding. The FY2005 request document is the first to include detailed out-year budget projections (in this case through FY2009) generated through the Future-Years Nuclear Security Program, providing a window into future plans.

The basis for the Pit Manufacturing and Certification Campaign was a record of decision on stockpile stewardship, published December 26, 1996, in which DOE "decided to ... reestablish pit fabrication capability, with a small capacity, at the Los Alamos National Laboratory."⁷ DOE estimated requirements at 20 pits per year to replace pits destroyed in surveillance testing, but also claimed that with the capability to produce all types of pits in the stockpile, it could produce "about 50 pits per year in single shift operations." It judged the latter rate would be sufficient for the next 10 years or more, rejected larger capacity because of small current demand and the long period before added capacity might be needed, and raised the prospect of greater capacity in the future.⁸

Short-Term Goal: W88 Pits

Rocky Flats Plant ceased production abruptly when it was only part-way through the planned production run of pits for the W88, a nuclear warhead used on the Trident II submarine-launched ballistic missile. Only one W88 pit remains for destructive evaluation.⁹ Accordingly, the most urgent short-term need of the current pit program is to produce and certify W88 pits. To accomplish these tasks, the W88 pit effort has two main elements within the Pit Manufacturing and Certification Campaign — W88 Pit Manufacturing and W88 Pit Certification. A third element, Pit Campaign Support Activities at NTS, mainly involves subcritical experiments at the Nevada Test Site to provide data that NNSA requires for W88 pit certification.

⁶ U.S. Department of Energy. Office of Chief Financial Officer. *FY 2002 Congressional Budget Request*. Vol. 1: National Nuclear Security Administration. DOE/CR-0072, April 2001, p. 61.

⁷ U.S. Department of Energy. "Record of Decision: Programmatic Environmental Impact Statement for Stockpile Stewardship and Management," *Federal Register*, December 26, 1996: 68015.

⁸ *Ibid.*: 68023-24.

⁹ Information provided by NNSA staff, March 3, 2004.

**Table 1. Pit Manufacturing and Certification Campaign Budget,
FY2001-FY2009**

(Budget Authority, \$ millions)

Fiscal Year	W88 Pit Mfg.	W88 Pit Certifi- cation	Pit Mfg. Capability	Modern Pit Facility	Support Activities at NTS	Total
2001 actual	95.4	51.8	8.0	2.0	30.0	187.2
2002 actual	103.2	86.8	5.6	8.9	44.5	249.0
2003 actual	109.9	105.1	1.2	4.2	41.5	261.9
2004 actual ^a	125.0	108.6	10.0	10.8	42.4	296.8
2005 request	132.0	101.5	21.0	29.8	52.2	336.5
2006 plan	132.6	88.9	23.3	43.3	35.5	323.6
2007 plan	139.9	45.3	34.4	94.6	0	314.2
2008 plan ^b	0	15.8	37.4	101.4	0	154.6
2009 plan ^b	0	0	53.0	105.2	0	158.2
Total	838.0	603.8	193.9	400.2	246.1	2282.0

Abbreviation: NTS, Nevada Test Site.

Source: FY2001 Support Activities at NTS figure was provided by NNSA March 3, 2004. Other FY2001 data: U.S. Department of Energy. Office of Management, Budget and Evaluation/CFO, *FY 2003 Congressional Budget Request*, vol. 1, National Nuclear Security Administration. DOE/ME-0001, February 2002, p. 170. FY2002 data: U.S. Department of Energy. Office of Management, Budget and Evaluation/CFO, *FY 2004 Congressional Budget Request*, vol. 1, National Nuclear Security Administration. DOE/ME-0016, February 2003, p. 225. FY2003-FY2009 data: U.S. Department of Energy. Office of Management, Budget and Evaluation/CFO, *FY 2005 Congressional Budget Request*, vol. 1, National Nuclear Security Administration. DOE/ME-0032, February 2004, p. 147.

Note: The Pit Manufacturing and Certification Campaign began in FY2001. Before then, pit funds were scattered in other programs, so earlier cost data are not available. The current Future-Years Nuclear Security Program projects funds out to FY2009; data beyond then are not available.

a. For FY2004, the pit campaign was reduced from \$298.5 million to \$296.8 million as a result of the omnibus rescission of 0.59 percent. The reduction was all applied to W88 pit manufacturing; the amount appropriated for that component was \$126.7 million. Source for the latter figure: U.S. Congress. Committee of Conference. *Making Appropriations for Energy and Water Development for the Fiscal Year Ending September 30, 2004, and for Other Purposes*. 108th Congress, 1st Session, H.Rept. 108-357, USGPO, p. 158.

b. FY2008 and FY2009 funding for W88 Pit Manufacturing is currently included in Directed Stockpile Work. NNSA estimates that the cost for this activity will be \$110 million a year for each of these two years. These amounts do not appear in Table 1, which presents funding for Campaigns.

As Table 1 shows, NNSA projects that W88 Pit Manufacturing will remain in the Pit Manufacturing and Certification Campaign through FY2007. In the FY2005 budget submission, W88 Pit Manufacturing continues in FY2008 and beyond in a different part of NNSA's Weapons Activities budget, Directed Stockpile Work (DSW), which is direct work on warheads currently in the stockpile. This was originally planned to mark the transition from manufacturing that supported certification to interim production of W88 pits. Pit Campaign Support Activities at NTS is not budgeted in FY2007 because subcritical experiments to support the W88 are planned to be completed in FY2006. Similarly, W88 Pit Certification budgets are planned to end after FY2008 as a result of expected certification in FY2007.

By way of background, the term "certifiable," and the four-year gap between delivery of a certifiable pit and a "certified" or "war reserve" pit, have caused much confusion. Certifiable pits meet quality control and process standards; certified pits meet product performance standards. A certifiable pit is manufactured using processes meeting standards set by the laboratory that designed the weapon and approved by NNSA. A war reserve pit is one that NNSA has determined to meet engineering and physics standards to be accepted for use in deployed nuclear weapons. NNSA has launched a major effort to establish that certifiable pits meet these product standards. It holds that it needs this effort because Los Alamos manufactures pits using different methods and equipment than did Rocky Flats. Rocky Flats pits were proven to work in underground nuclear tests at the Nevada Test Site. The U.S. nuclear test moratorium, which started in 1992 and continues to the present, bars similar tests on pits manufactured at Los Alamos. NNSA plans to provide the basis for certifying pits without nuclear tests by demonstrating through computer models, subcritical experiments,¹⁰ small-scale laboratory experiments, experiments using multimillion-dollar nuclear physics facilities, and archived data from past nuclear tests that Los Alamos pits are equivalent to Rocky Flats pits in many key characteristics, and by resolving uncertainties conservatively, such as by insisting on tighter specifications and greater manufacturing precision. In these ways, NNSA seeks to provide confidence that Los Alamos pits will work as designed.

To meet the need for W88 pits, NNSA decided to create at Los Alamos a facility that could produce pits at a low rate. The facility is housed in PF-4 (plutonium facility 4), which opened in 1978 for plutonium R&D. It occupies about 30% of the space in PF-4 available for plutonium operations; another 25% is reserved for plutonium metal preparation. Los Alamos manufactured the first certifiable W88 pit in April 2003. NNSA expects Los Alamos to produce six or more certifiable W88 pits in FY2005, "to achieve, by FY2007, a sustained manufacturing rate of 10-

¹⁰ CRS offers the following definition based on documents and on discussions with DOE and laboratory staff: "Subcritical experiments at Nevada Test Site involve chemical high explosives and fissile materials in configurations and quantities such that no self-sustaining nuclear fission chain reaction can result. In these experiments, the chemical high explosives are used to generate high pressures that are applied to the fissile materials. The only fissile material used in the 19 subcritical experiments held from 1997 through 2002 is plutonium-239." NNSA states that these experiments support certification of W88 pits. *Department of Energy FY2004 Budget Request*, vol. 1, p. 77.

20 pits/year,” and to complete certification work in FY2007.¹¹ NNSA also expects Los Alamos to certify in FY2007 the first W88 pit made there.¹²

In March 2004, NNSA indicated that certification was on track, and that production of certifiable pits was proceeding extremely well, with five such pits produced as of early March 2004.¹³ The near-term goal is to produce those pits needed to support certification experiments. Each early pit has a specific physics and engineering certification test purpose and will exercise the processes required to confirm that production is reliable and efficient. Accordingly, there is no reason now to produce pits faster than the schedule calls for. Once certification activities are complete, NNSA may choose to increase the production rate.

In theory, nuclear testing could accelerate pit certification. A successful test would demonstrate promptly that a pit worked and that the processes used to make it were acceptable. In practice, however, NNSA would probably conduct a series of tests because a single test would not likely provide sufficient confidence and the first test might indicate the need for changes that would require subsequent tests to validate. Further, it would take 2 or 3 years from a presidential decision to test until the conduct of a first test. While the Administration plans to reduce that time, perhaps to 18 months, it would take some time to make that change. Compared to the current program if it proceeds as anticipated, then, testing might accelerate certification by a year or so.

PF-4’s capacity and schedule, and the schedule for pit certification, have changed over time, and statements have been contradictory.

- In the December 1996 record of decision cited above, DOE appeared to need a capacity of 20 pits per year, would wind up with a capacity of 50 a year, and found the latter sufficient for some time. “DOE foresees only the replacement of pits destroyed in routine surveillance testing unless a near-term, life-limiting phenomenon is discovered in stockpile pits. ... The technological capability to manufacture all of the pit designs in the enduring stockpile provides an inherent capacity to manufacture about 50 pits per year in single shift operations. ... About 20 pits per year are expected to be

¹¹ U.S. Department of Energy. Office of Management, Budget and Evaluation/CFO. *FY 2005 Congressional Budget Request*, vol. 1, National Nuclear Security Administration. DOE/ME-0032, February 2004, p. 153.

¹² U.S. Department of Energy. National Nuclear Security Administration. “Pit Manufacturing and Certification Campaign: Report to Congress, Fiscal Year 2002.” Delivered to Congress March 28, 2003, p. 1. This report was submitted in response to a requirement set forth in U.S. Congress. Senate. Committee on Appropriations. *Energy and Water Development Appropriation Bill, 2003*, S.Rept. 107-220, 107th Congress, 2nd Session, USGPO, 2002, p. 98; and U.S. Congress. Committee of Conference. *Conference Report on H.J.Res. 2, Consolidated Appropriations Resolution, 2003*, as printed in U.S. Congress. *Congressional Record*, February 12, 2003: H 1025.

¹³ This paragraph is based on discussions with NNSA Pit Project Office staff, December 4 and 9, 2003, and March 3, 2004.

required to replace pits destroyed in routine surveillance testing. A capacity of about 50 pits per year is, therefore, judged to be sufficient for the next 10 or more years.”¹⁴

- The FY1999 DOE budget request, released February 1998, stated, “In accordance with the Record of Decision on the Programmatic Environmental Impact Statement, the current objective is to establish a long term capacity for manufacturing up to 50 pits/year with a single shift of personnel.”¹⁵ Further, DOE planned to “[p]roduce a single WR [war reserve] pit per year at LANL beginning in FY 1998 and provide up to 10 pits annually into the stockpile [i.e., certified as war reserve] beginning in FY 2001 to meet near-term requirements” and to “[m]eet schedules to rebuild, qualify and certify Trident II [W88] pits by FY2001 and develop intermediate pit production capability of 20 pits per year at the Los Alamos National Laboratory by 2007.”¹⁶
- In the September 1999 record of decision on the site-wide environmental impact statement for Los Alamos National Laboratory, DOE decided to establish at Los Alamos a capacity to produce nominally 20 pits per year to be achieved in 2007. “While this [decision] does not change the 50-pit-per-year mission assignment made in the Stockpile Stewardship and Management Programmatic Environmental Impact Statement Record of Decision, it does suspend full implementation of that decision until an undetermined time in the future.”¹⁷
- In 2000, NNSA stated, “FY 2001 efforts will support W88 pit certification by FY 2005.”¹⁸
- In 2001, the Administration proposed having a certified pit available in FY2009.¹⁹

¹⁴ U.S. Department of Energy. “Record of Decision: Programmatic Environmental Impact Statement for Stockpile Stewardship and Management,” *Federal Register*, December 26, 1996: 68023.

¹⁵ U.S. Department of Energy. Office of the Chief Financial Officer. *FY 1999 Congressional Budget Request*. Vol. 1, Atomic Energy Defense Activities. DOE/CR-0051, February 1998, p. 126.

¹⁶ *Ibid.*, p. 125-126.

¹⁷ U.S. Department of Energy. “Record of Decision: Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory in the State of New Mexico,” *Federal Register*, September 20, 1999: 50803.

¹⁸ U.S. Department of Energy. Office of the Chief Financial Officer. *FY 2001 Congressional Budget Request*. Vol. 1, National Nuclear Security Administration, DOE/CR-0068-1, p. 83.

¹⁹ U.S. Congress. Senate. Committee on Appropriations. *Energy and Water Development* (continued...)

- An October 2002 NNSA document stated that “establishment of an interim pit production capacity of up to 20 pits per year at Los Alamos National Laboratory (LANL) is expected to be completed in 2007.”²⁰
- In March 2003, NNSA stated, “NNSA will ... [e]stablish a small (10 pits/year) W88 pit production capability at LANL with a goal of FY 07.”²¹
- And in February 2004, NNSA stated its intent “to enable the plutonium facility at LANL TA-55 to achieve, by FY2007, a sustained manufacturing rate of 10-20 pits/year.”²²

These changes have occurred for several reasons. NNSA has, over time, developed a better sense of how many pits would be needed. Los Alamos has found that certifying pits is more complicated and time-consuming than it had anticipated at first. The schedule has slipped. Further, the documents, or people’s reading of them, have led some to confuse available and required capacity.

Intermediate-Term Goal: Other Pits

The Pit Manufacturing and Certification Campaign has an intermediate-term element, Pit Manufacturing Capability (PMC), for “[p]it manufacturing and certification activities not specifically supporting the W88.” This includes work on pits for the W87 warhead, currently carried by Minuteman III intercontinental ballistic missiles, and the B61 mod 7, a gravity bomb. NNSA notes that these two pits, together with the W88 pit, “span technical variations of pits within the stockpile.”²³ That is, the ability to manufacture and certify these three pits would help NNSA manufacture and certify all types of existing pits that may need such work in the future. While PF-4 could build some W87 and B61 developmental pits by 2012 under current plans, PMC would not manufacture war reserve pits for these warheads because many spare pits of these types are available to be cut apart for examination in ways that preclude their reassembly and reuse. Rather, PMC will develop manufacturing technologies that NNSA plans to use in fabricating pits for these and other warheads in PF-4 or the Modern Pit Facility. Table 1 shows Pit Manufacturing Capability increasing substantially; as pilot work on W88 pit manufacturing and certification is transferred out of the Pit Manufacturing and

¹⁹ (...continued)

Appropriation Bill, 2002. 107th Congress, 1st Session. Washington, U.S. Govt. Print. Off., 2001, S.Rept. 107-39, p. 115.

²⁰ U.S. Department of Energy. National Nuclear Security Administration. “Site Alternatives: Modern Pit Facility.” October 2002, 3 p. Via [<http://www.mpfeis.com>].

²¹ NNSA, “Pit Manufacturing and Certification Campaign, Report to Congress, Fiscal Year 2002,” p. 1.

²² Department of Energy, *FY 2005 Congressional Budget Request*, vol. 1, p. 153.

²³ *Department of Energy FY 2004 Congressional Budget Request*, vol. 1, p. 227.

Certification Campaign, this campaign shifts to develop manufacturing capability for other types of pits.

Long-Term Goal: Modern Pit Facility

Plutonium, a radioactive metal, decays radioactively and generates heat. As a result, plutonium pits undergo metallurgical and other changes that may affect weapon performance.²⁴ As of May 2003, “the NNSA weapons laboratories have determined that pits will perform adequately for 45-60 years.”²⁵ This remains NNSA’s estimate as of March 2004. This estimate could increase or decrease based on experimental data, further analysis, or data obtained by examining pits from deployed weapons. Accordingly, NNSA is working to refine its estimate. Two of its labs are performing “pit aging experiments and modeling to determine whether pit lifetimes equal or exceed 60 years ...”²⁶ Los Alamos is conducting experiments that accelerate sixteenfold a key process that ages plutonium.²⁷ Livermore will also conduct studies related to assessing pit life.²⁸ The results will help define whether a potential new pit manufacturing facility should be accelerated or delayed, and what capacity would be appropriate. In addition to funds for the Pit Manufacturing and Certification Campaign, NNSA requested \$25.9 million for FY2004 for a component of another campaign, Enhanced Surveillance, to support pit aging research.²⁹ The FY2005 NNSA budget document did not break out funds for pit aging research.

Several factors — a larger stockpile, shorter pit life, a desire to build pits for new-design warheads, or a desire to hedge against the prospect that a type of pit develops a problem that necessitates replacing all units quickly — would increase the production capacity needed or require having that capacity sooner, or both. A smaller stockpile, etc., would have the opposite effect. International events could work in either direction. The implications of plutonium aging for the need and schedule for new pits are therefore debated. Some outside government argue that there is no clear end to pit life, or that pits could last many more decades. Further, some claim that with thousands of spare pits available from retired warheads, many would be available as “a ‘hedge’ against aging in the remaining arsenal.”³⁰ Responding to

²⁴ These changes are detailed in U.S. Department of Energy. National Nuclear Security Administration. *Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility*. DOE/EIS-236-S2, May 2003 (hereinafter *MPF EIS*), Summary, p. S-11, S-12. This document is available via [<http://www.mpfeis.com>].

²⁵ *MPF EIS*, Summary, p. S-12.

²⁶ *Department of Energy FY 2002 Congressional Budget Request*, vol. 1, p. 97.

²⁷ “Accelerated Aging of Plutonium (AAP),” *Weapons Insider: A Publication of the [Los Alamos] Nuclear Weapons Program*, July-August 2002: 1-2.

²⁸ *Department of Energy FY2004 Budget Request*, vol. 1, p. 114.

²⁹ *Department of Energy FY2004 Budget Request*, vol. 1, p. 152.

³⁰ Greg Mello, “No Need for a Large-Scale Pit Facility: Existing Los Alamos Facilities Are Adequate,” Los Alamos Study Group, remarks and press advisory, October 24, 2002, (continued...)

concerns that plutonium will deteriorate in ways that impair weapon performance, one report finds that plutonium undergoes “benign aging” and “exhibits good crystalline order even after decades of aging.”³¹ It may also be argued that any decision on future pit production can be put off until there is reasonable evidence on the “shelf life” of pits.

NNSA, on the other hand, believes that pits will ultimately fail to function. If one type of pit used in deployed warheads goes bad, then, depending on the specifics of the problem, there might be no confidence in any of the hundreds to thousands of warheads using that pit, or in spare pits of that type, which would age at the same rate as pits in deployed warheads. NNSA’s view is that maintaining the stockpile indefinitely therefore requires, in the longer term, a higher pit fabrication capacity than PF-4 can offer in order to replace pits removed due to aging or destructive testing. Similarly, the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile (the Foster Panel) observed, “While it is desirable to attempt to forecast the life spans of plutonium and other weapon components, we must be able to replace such parts if our predictions are incorrect or our needs for deterrence change,” and recommended that NNSA “[e]stablish, with urgency, a pit production capability adequate for national needs.”³² Responding to the argument that plutonium aging will not impair weapon performance for a long time, NNSA asserts that, based on research at the weapons labs, “increased delta-phase stability [of plutonium] with aging cannot be assumed.”³³

Because of — or, depending on one’s point of view, despite — uncertainty about pit life, NNSA has decided to proceed with planning for a new facility, the Modern Pit Facility (MPF), which is another element of the Pit Manufacturing and Certification Campaign. NNSA is currently assessing a capacity from 125 to 450 pits per year in single-shift operation.³⁴ (Choice of capacity would depend on requirements for production, reserve capacity, and expansion potential, all to be determined.) NNSA estimates that MPF operations will start in FY2019 and that the plant will achieve full production capability in FY2021.³⁵ (Table 4 includes MPF milestones.) The Senate Armed Services Committee in 2002 estimated the cost of MPF at \$2 billion to \$4 billion.³⁶ NNSA personnel stated in March 2004 that this estimate remains the same.

³⁰ (...continued)
available at [http://www.lasg.org/hmpgfrm_b.html].

³¹ Raymond Jeanloz, “Science-Based Stockpile Stewardship,” *Physics Today Online*, December 2000; [<http://www.physicstoday.org/pt/vol-53/iss-12/p44.html>].

³² U.S. Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile, FY2001 report, submitted March 15, 2002, p. ES-8, 21.

³³ *MPF EIS*, p. S-13.

³⁴ *Ibid.*, p. S-27.

³⁵ Department of Energy, *FY2004 Budget Request*, vol. 1, p. 150.

³⁶ U.S. Congress. Senate. Committee on Armed Services. *National Defense Authorization Act for Fiscal Year 2003*, 107th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 2002, S.Rept. 107-151, p. 461.

The supplemental programmatic environmental impact statement (EIS) on stockpile stewardship and management for MPF evaluates five candidate sites: Los Alamos National Laboratory, NTS, Pantex Plant (TX), Savannah River Site (SC), and the Waste Isolation Pilot Plant (NM).³⁷ Public meetings were held at these sites and in Washington, DC, in June and July 2003 to obtain public comments on the draft EIS.³⁸ The final EIS was scheduled for publication by April 2004, but NNSA stated in January 2004 that it delayed this document because of the congressional concerns just noted.³⁹ NNSA did not indicate a new release date or whether this decision would delay MPF.

MPF has not proceeded on an accelerated basis because of competing priorities, uncertainties in the size of the stockpile and pit lifetimes, and the value for MPF of gaining experience from Los Alamos's pit efforts. The Nuclear Posture Review and approval of mission need provided impetus for NNSA to give higher priority to MPF. This higher priority was to begin in FY2004, as reflected in the increased request from \$2.1 million in FY2003 to \$22.8 million in FY2004. As discussed under "The FY2004 Request," below, however, the FY2004 Energy and Water Development Appropriations Act, P.L. 108-137, reduced funds for MPF from the requested \$22.8 million to \$10.8 million on grounds that it would be premature to pursue further decisions on MPF pending congressional review of the nuclear stockpile plan. NNSA stated that, in general, reductions could cut either the scope of activity, or the schedule. In this case, scope involves activities conceptual design and steps to comply with the National Environmental Protection Act. Since these activities are required for MPF, NNSA anticipates that the reduction will result in a slippage of the schedule. It estimates the slippage at one year. Future technical developments, funding decisions, or other actions might offset this delay if decisionmakers later determine that a one-year slip is inadvisable for the long term.⁴⁰ As Table 1 shows, NNSA projects a substantial increase in MPF's budget through FY2009.

MPF's schedule has slipped between June 2003 and February 2004, as Table 2 shows. NNSA states that this delay was caused by congressional reductions to the FY2004 budget request.

³⁷ U.S. Department of Energy. National Nuclear Security Administration. "Notice of Intent to Prepare a Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility," *Federal Register*, September 23, 2002: 59579.

³⁸ See the MPF website, [<http://www.mpfeis.com>], for transcripts of these meetings.

³⁹ U.S. Department of Energy. National Nuclear Security Administration. "NNSA Delays Modern Pit Facility Environmental Impact Statement and Selection of a Preferred Location," press release NA-04-01, January 28, 2004.

⁴⁰ Discussions with NNSA Pit Project Office staff, December 4 and 9, 2003.

Table 2. MPF Schedule Slippage, June 2003 to February 2004

Milestone	June 2003	February 2004
Publish MPF EIS, issue Record of Decision on MPF site selection	April 2004	unspecified
Approve Critical Decision 1 (CD-1), system requirements and alternatives	February 2006	FY2006
Complete site-specific EIS	April 2006	FY2007
Approve CD-2, cost and schedule baseline	before end of FY2008	FY2009
Approve CD-3, start of construction	at end of FY2011	FY2012
Approve CD-4, start of operations	at end of FY2017	FY2018
Start of initial operations	FY2018	FY2019
Start of full-scale production	FY2020	FY2021

Source: June 2003 data are from U.S. Department of Energy. National Nuclear Security Administration. "Modern Pit Facility Fact Sheet," p. 2, June 2003, available at [<http://www.mpfeis.com>], click on "Fact Sheets" and then on "Modern Pit Facility Fact Sheet." February 2004 data are from Department of Energy, *FY 2005 Congressional Budget Request*, vol. 1, February 2004, p. 147-154, except that the entry for "publish MPF EIS ..." is from U.S. Department of Energy. National Nuclear Security Administration. "NNSA Delays Modern Pit Facility Environmental Impact Statement and Selection of a Preferred Location." Press release, January 28, 2004, p. 1.

DOE's report on MPF acceleration. In its report on the FY2004 defense authorization bill, the Senate Armed Services Committee directed DOE to submit a report on options for accelerating MPF's schedule, and how DOE planned to maintain expertise and provide a flexible facility. The committee further directed that "DOE must have a requirement established to ensure that the MPF is appropriately sized."⁴¹ DOE submitted the report, dated February 1, 2004.⁴² In brief, it states that MPF's schedule can be accelerated and that the Los Alamos facility will have inadequate capacity for all but the smallest stockpiles. Key points are summarized below; page numbers in parentheses refer to the DOE report.

- MPF's schedule can be accelerated by 3 to 4 years by such measures as minimizing transitions between design steps, accelerating the

⁴¹ U.S. Congress. Senate. Committee on Armed Services. *National Defense Authorization Act for Fiscal Year 2004*, report to accompany S. 1050, S.Rept. 108-46, 108th Congress, 1st Session, USGPO 2003, p. 457-458.

⁴² Department of Energy, *National Nuclear Security Administration Report to Congressional Defense Committees on "An Enhanced Schedule for the Modern Pit Facility."*

design schedule, starting some construction actions before completing the final design, and using a longer work week. (16)

- Some costs to accelerate the schedule are a modest fraction of the total project cost. Planning activities before construction starts are expected to account for more than half the total project time at about a fifth of the estimated cost. (5)
- Accelerating MPF can reduce its required capacity. Rocky Flats produced most currently-stockpiled pits between 1978 and 1989. If pits have a 60-year life, they would “expire” between 2038 and 2049. The time available to remanufacture them largely sets the number that must be produced each year. Accelerating MPF would spread that production run over more years, lowering required capacity. After the initial run, production could be done at a steady, lower rate. NNSA did not provide numbers linking schedule to capacity, as they are classified. (11-12)
- Using PF-4/TA-55⁴³ as the sole pit facility has many drawbacks. NNSA states that it “requires the agility to simultaneously manufacture different types of pits,” and that TA-55 cannot provide such agility for a stockpile sized in the 1000's of warheads because of inadequate floor space. NNSA says it “could make do with TA-55 if the long-term stockpile is at a level in the 100's of weapons with a reduced number of pit types and if modifications to TA-55 to manufacture 50 pits per year could be made without constructing an additional building.” It recommended against this upgrade for such reasons as “high risk” that it could not do the upgrade within TA-55; the upgrade might be completed around 2015, at which point the facility would be about 40 years old, and it would be “problematic” to operate it another 50 years; and the layout, designed for R&D, is “not optimal for production operations.” (13-14)
- NNSA plans to take various steps to preserve expertise in pit production. These include maintaining an interim production capability at Los Alamos, drawing on U.S. experts in plutonium, manufacturing, and nuclear facility operations for planning MPF, and starting to hire and train staff for MPF at least 5 years before operations start. (18)
- NNSA staff stated that there are too many uncertainties to establish an annual requirement for numbers and types of pits to be produced when MPF is operational.⁴⁴ Instead, NNSA arrived at a range of capacities by examining the range of variance of such factors as size and composition of the stockpile in the future, pit lifetime, and when

⁴³ PF-4 is located within Technical Area 55 (TA-55) at Los Alamos. The two terms are often used interchangeably.

⁴⁴ Information provided by NNSA staff, March 17, 2004.

full-scale production might start. NNSA will continue to revalidate MPF capacity. (21) In particular, 125 pits per year is a reasonable estimate for the minimum capacity: “A minimum set of pit manufacturing equipment would result in a manufacturing facility with a capacity of approximately 125 pits/year.” (19)

Challenges to DOE’s report on MPF acceleration. The case for accelerating, or even building, MPF might be challenged in the following ways:

- If PF-4 began production at a rate of 50 pits per year in 2015, and the stockpile many years from now had 2,000 pits (both deployed and non-deployed), PF-4 could produce 1,750 of these pits by 2050. (A future stockpile in this range is possible. The Strategic Offensive Reductions Treaty calls for 1,700-2,200 deployed strategic warheads by 2012 and there are additional stockpiled pits that are not deployed; on the other hand, the number of deployed nuclear forces has been declining for 20 years or more.)
- If MPF’s capacity is 125 pits per year, and the stockpile many years from now included 2,000 pits, then NNSA could rebuild these pits in 16 years. If the rebuild had to be finished by 2050, then in theory MPF could begin operations in 2034. It might be well to advance this date by a few years to provide a margin in case unanticipated problems required an earlier rebuild of some warheads. Even in that case, it could be argued that there is no need to complete MPF by 2021, let alone to accelerate it.
- Accordingly, while MPF might be accelerated by a few years at a fraction of the projected cost, it might arguably be a better use of funds to wait on MPF until pit life and future stockpile size became clearer. If it appears some years from now that the future stockpile will drop sharply, then PF-4 might suffice, yielding a net savings.
- Large-scale production at MPF is scheduled to begin three decades after Rocky Flats shut. MPF would involve different people than Rocky Flats, at a different location, in a new facility, with different equipment and processes. Despite ongoing efforts for certification, it could be argued that uncertainties would be likely to arise about the performance of MPF pits. These uncertainties could generate pressure to conduct nuclear tests. Keeping the production line open at TA-55 might reduce these uncertainties.
- Despite explicit direction by the Senate Armed Services Committee that the report base MPF capacity on specific requirements, NNSA based capacity on parametric analysis. It may be that there was no other reasonable approach, and a capacity of 125 pits per year may turn out to be needed. If it is found that a substantially smaller capacity is needed once MPF is well along, however, the United States would be committed to MPF even though it would in this case have been less costly to use PF-4.

Congressional Actions

Congress has expressed interest in the pit program for many years. Both Houses have repeatedly raised concerns over such management issues as budgeting and planning, and over the slow pace of pit certification. Both Houses have supported low-rate pit production at Los Alamos.

Requests and Responses, FY1997-FY2003

FY1997 National Defense Authorization Act conferees required the Secretary of Energy to submit “a report on plans for achieving a capability to produce and remanufacture plutonium pits.”⁴⁵ FY1999 conferees directed the Secretaries of Energy and Defense “to prepare a long range plan identifying pit production requirements.”⁴⁶ FY2001 authorization conferees directed DOE to start conceptual design “for a pit production facility with a capacity adequate to meet future national security needs immediately.”⁴⁷ Appropriations conferees called the pit production program “behind schedule and over cost,” and faulted DOE’s “lack of attention to this critical program.”⁴⁸

For FY2002, the House Appropriations Committee recommended the requested amount, \$128.5 million, for the Pit Manufacturing and Certification Campaign, but asserted that DOE cannot show “that it has a viable plan to manufacture and certify pits on the schedule dictated by national security needs,” criticized the project as “years behind schedule and hundreds of millions of dollars over the original cost estimate,” and stated that it would judge NNSA’s success on how well the pit project succeeds.⁴⁹ The Senate Appropriations Committee recommended increasing funding by \$109.2 million to “fully fund” all relevant activities, viewing the then-current schedule, which would not certify a pit for use in the stockpile until FY2009, as

⁴⁵ U.S. Congress. Committee of Conference. *National Defense Authorization Act for Fiscal Year 1997*. Conference report to accompany H.R. 3230. 104th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 1996, H.Rept. 104-724, p. 909.

⁴⁶ U.S. Congress. Committee of Conference. *Strom Thurmond National Defense Authorization Act for Fiscal Year 1999*. Conference report to accompany H.R. 3616. 105th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 1998, H.Rept. 105-736, p. 803.

⁴⁷ U.S. Congress. Committee of Conference. *Enactment of Provisions of H.R. 5408, the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001*. Conference report to accompany H.R. 4205. 106th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 2000, H.Rept. 106-945, p. 949-950.

⁴⁸ U.S. Congress. Committee of Conference. *Making Appropriations for Energy and Water Development for the Fiscal Year Ending September 30, 2001, and for Other Purposes*. Conference report to accompany H.R. 4733. 106th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 2000, H.Rept. 106-907, p. 103.

⁴⁹ U.S. Congress. House. Committee on Appropriations. *Energy and Water Development Appropriations Bill, 2002*. 107th Congress, 1st Session. Washington, U.S. Govt. Print. Off., 2001, H.Rept. 107-112, p. 125.

“unacceptable.”⁵⁰ On September 28, 2001, after the two Appropriations Committee reports had been completed, NNSA notified the committees that projected cost for this campaign had increased to \$219.0 million, and the conference bill provided this latter amount.⁵¹

The Senate Armed Services Committee recommended providing \$237.7 million to “fully fund all increases associated with efforts to manufacture and certify a new pit.” Further, “the committee believes it is premature to rush to design a new pit manufacturing facility when there are significant uncertainties about the size of the nuclear weapons stockpile in the future and until such time as the ability to manufacture a certifiable pit is restored.” Recognizing concerns raised by the Foster Panel, however, the committee “urge[d] the administration to begin a time-phased program to design and build a pit production facility,” i.e., MPF.⁵² The House Armed Services Committee bill included the requested amount, noted that W88 pit certification had slipped from FY2007 to FY2009 “with no commitment to meeting the latter date,” expressed its concern that “the budget request woefully under funds this important activity and urges the NNSA to place higher priority on pit certification in future budget submissions.”⁵³ The conference bill provided \$219.0 million.

The FY2003 request was \$194.5 million. NNSA stated its plans to “certify a W88 pit built at [Los Alamos National Laboratory] without underground nuclear testing by FY 2009, with a goal of achieving an earlier date of FY 2007.”⁵⁴ Further, NNSA planned to defer detailed design of a Modern Pit Facility until FY2004, “with FY 2003 funding used to continue manufacturing concepts.”⁵⁵

The House Armed Services Committee recommended providing the requested amount. It expressed its belief that Los Alamos’s planned capacity was inadequate for the long run, and that “prudence dictates a need to proceed immediately, with

⁵⁰ U.S. Congress. Senate. Committee on Appropriations. Energy and Water Development Appropriation Bill, 2002. 107th Congress, 1st Session. Washington, U.S. Govt. Print. Off., 2001, S.Rept. 107-39, p. 114-115.

⁵¹ U.S. Congress. Committee of Conference. *Making Appropriations for Energy and Water Development for the Fiscal Year Ending September 30, 2002, and for Other Purposes*, 107th Congress, 1st Session, Washington, U.S. Govt. Print. Off., 2001, H.Rept. 107-258, p. 128.

⁵² U.S. Congress. Senate. Committee on Armed Services. *National Defense Authorization Act for Fiscal Year 2002*, 107th Congress, 1st Session. Washington, U.S. Govt. Print. Off., 2001, S.Rept. 107-62, p. 434-435.

⁵³ U.S. Congress. House. Committee on Armed Services. *National Defense Authorization Act for Fiscal Year 2002*, 107th Congress, 1st Session. Washington, U.S. Govt. Print. Off., 2001, H.Rept. 107-194, p. 438.

⁵⁴ U.S. Department of Energy. Office of Chief Financial Officer. *Department of Energy FY2003 Congressional Budget Request*. Vol. 1, National Nuclear Security Administration. DOE/ME-0001, February 2002, p. 169.

⁵⁵ *Ibid.*, p. 173.

preliminary steps to re-establish a large scale pit production facility.”⁵⁶ The Senate Armed Services Committee recommended adding \$5 million to the pit campaign to allow the EIS for MPF to proceed, urged NNSA and DOD “to establish a valid annual pit requirement,” and cautioned NNSA not to begin construction on MPF until DOD and DOE have approved a valid requirement for it.⁵⁷ The conference bill provided \$199.5 million for the campaign, an increase of \$5.0 million over the request.

In its report on FY2003 energy and water appropriations, the Senate Appropriations Committee recommended \$246.0 million for pit manufacturing and certification, an increase of \$51.5 million over the request. The committee, however, “remain[ed] greatly concerned about the NNSA’s refusal to request funds consistent with its own project plan submitted less than 1 year ago.” Because this was not done, which would have resulted in a lower request for this important project, “the Committee has been forced to reduce other items in the budget.” The Senate Appropriations Committee directed NNSA to revise the plan and report to Congress before the end of the current fiscal year and then annually.⁵⁸ The House Appropriations Committee provided \$194.5 million, the requested amount, for pit manufacturing and certification. The final appropriation for pit manufacturing and certification was \$222.0 million. (With a 0.65% rescission, a general reduction, and reprogramming, the adjusted appropriation was \$220.6 million.) According to the joint explanatory statement of the Committee of Conference, “The increase will ensure that the NNSA maintains its commitment to produce a certifiable W88 pit by 2003 and a certified W88 pit by 2007.” The conference statement directed NNSA “to provide a revised pit production and certification plan to the relevant Congressional committees by March 31, 2003, and annually thereafter.”⁵⁹

The FY2004 Request

For FY2004, the Administration requested a substantial increase to items in this campaign: \$126.8 million for manufacturing the pit for the W88 warhead, \$108.6 million for W88 pit certification, \$19.7 million for pit activities not specifically supporting the W88, and \$22.8 million for planning for the Modern Pit Facility. In addition, it requested \$42.4 million for “subcritical experiments [at Nevada Test Site]

⁵⁶ U.S. Congress. House. Committee on Armed Services. *Bob Stump National Defense Authorization Act for Fiscal Year 2003*, 107th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 2002, H.Rept. 107-436, p. 410-411.

⁵⁷ U.S. Congress. Senate. Committee on Armed Services. *National Defense Authorization Act for Fiscal Year 2003*, 107th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 2002, S.Rept. 107-151, p. 461.

⁵⁸ U.S. Congress. Senate. Committee on Appropriations. *Energy and Water Development Appropriation Bill, 2003*, 107th Congress, 2nd Session. Washington, U.S. Govt. Print. Off., 2002, S.Rept. 107-220, p. 98.

⁵⁹ U.S. Congress. Committee of Conference. *Conference Report on H.J.Res. 2, Consolidated Appropriations Resolution, 2003*, as printed in U.S. Congress. *Congressional Record*, February 12, 2003: H1024-H1025.

which support the certification of the W88 pit.”⁶⁰ For FY2004, this latter funding element was transferred into the Pit Manufacturing and Certification Campaign from Directed Stockpile Work, another component of the stockpile stewardship program; its FY2003 request was \$41.5 million. Thus the total request for FY2004 was \$320.2 million, an increase of 35.7% over the FY2003 request of \$236.0 million (with both figures including subcritical experiments supporting W88 pit certification).

In H.R. 1588 and S. 1050, National Defense Authorization Act for Fiscal Year 2004, each Armed Services Committee recommended authorizing the full amount requested for the Pit Manufacturing and Certification Campaign. The Senate Armed Services Committee urged DOE to evaluate options for accelerating MPF and for maintaining pit production expertise until MPF opens, and to indicate how the production program can be made able to respond rapidly to needs for multiple types of pits or for pits that can meet “changing military requirements.” Accordingly, the committee directed the Secretary of Energy to report on steps DOE is taking to accelerate MPF and protect production expertise, and to provide “a schedule to establish a requirement by pit type by year ... to ensure that the MPF is appropriately sized.” It directed that the report be submitted to the congressional defense committees with the FY2005 budget request.⁶¹ (The report is summarized above under “Long-Term Goal: Modern Pit Facility.”) The conference bill included the full request for the Pit Manufacturing and Certification Campaign; the report (H.Rept. 108-354) did not comment on the matter, which was not at issue between House and Senate. On November 7, the House agreed to the conference report on H.R. 1588, 362-40; the Senate agreed to the report, 95-3, on November 12. The President signed the measure into law (P.L. 108-136) on November 24.

The House Appropriations Committee saw the pit campaign as proceeding too quickly. In H.R. 2754, Energy and Water Development Appropriations for 2004, it recommended reducing the request for this campaign by \$47.0 million, still an increase of \$12.2 million over the FY2003 budget. The committee praised NNSA and Los Alamos National Laboratory for “turning around” this campaign, but urged NNSA to reduce costs. It stated that the current plan would “aggressively pursue a multi-billion dollar Modern Pit Facility before the first production pit has even been successfully certified for use in the stockpile.” In reducing MPF to \$10.8 million from the requested \$22.8 million, it recommended that NNSA should look hard at better ways to use the Los Alamos pit production facility for near-term requirements and “take a less aggressive planning approach” to MPF. It felt that it was premature to spend \$19.7 million to develop technologies for manufacturing pits other than for the W88 when MPF was at least 15 years from operating, and so recommended reducing this part of the request to \$4.7 million.⁶² On July 18, 2003, the House passed H.R. 2754 without amending the Weapons Activities section, which includes

⁶⁰ *Department of Energy FY2004 Budget Request*, vol. 1, p. 77.

⁶¹ U.S. Congress. Senate. Committee on Armed Services. *National Defense Authorization Act for Fiscal Year 2004*, report to accompany S. 1050, S.Rept. 108-46, 108th Congress, 1st Session, USGPO 2003, p. 457-458.

⁶² U.S. Congress. House. Committee on Appropriations. *Energy and Water Development Appropriations Bill, 2004*. H.Rept. 108-212. 108th Congress, 1st Session, USGPO, 2003, p. 147-148.

funds for the Pit Manufacturing and Certification Campaign. The Senate Appropriations Committee recommended the amount requested for this campaign.⁶³ In floor action on September 16, the Senate tabled, 53-41, Amendment 1655 by Senator Feinstein that would, among other things, have barred use of funds for MPF site selection. No other amendments on pits were offered. Later that day, the Senate passed H.R. 2754 (amended to incorporate the Senate bill, S. 1424), 92-0.

The energy and water development appropriations conference report, H.Rept. 108-357, provided \$298.5 million for the Pit Manufacturing and Certification Campaign. The two reductions to this campaign, totaling \$21.7 million, were \$9.7 million to pit activities not specifically supporting the W88, and \$12.0 million to MPF. Regarding MPF, the conference report directed the Secretaries of Energy and Defense to report to Congress with their plan to achieve the nuclear force reductions in the President's revised Nuclear Weapons Stockpile Memorandum, which made sharp cuts, for example, in deployed strategic nuclear weapons. The conference report stated: "The conferees agree with the House Report that until the Congress reviews the revised future Stockpile plan it is premature to pursue further decisions regarding the Modern Pit Facility." On November 18, the two Houses agreed to the conference report, the Senate by unanimous consent and the House by a vote of 387-36. The President signed the measure into law (P.L. 108-137) on December 1.

The FY2005 Request

As noted earlier, the FY2005 request continues W88 Pit Manufacturing and W88 Pit Certification at about the same level as FY2004, boosts funding somewhat for Support Activities at NTS, and substantially increases funding for Pit Manufacturing Capability and MPF. Table 3 shows the request and tracks congressional action on it.

Table 3. Congressional Action on FY2005 Pit Program Request
(Budget Authority, \$ millions)

	Request	HASC	SASC	Conf.	HAC	SAC	Conf.
W88 Pit Mfg.	132.0						
W88 Pit Cert	101.5						
Pit Mfg Capby	21.0						
MPF	29.8						
Support Activities at NTS	52.2						

⁶³ U.S. Congress. Senate. Committee on Appropriations. *Energy and Water Development Appropriation Bill, 2004*. S.Rept. 108-105. 108th Congress, 1st Session, USGPO, 2003, p. 139.

Abbreviations: Mfg., manufacturing; Cert., certification; Capby, capability; MPF, Modern Pit Facility; NTS, Nevada Test Site; HASC, House Armed Services Committee; SASC, Senate Armed Services Committee; Conf., conference; HAC, House Appropriations Committee; SAC, Senate Appropriations Committee.

The FY2005 budget document is the first to include a detailed breakout for out years, making it possible to see NNSA's plans for pit program elements. These elements are funded under Campaigns, as shown in Table 1. NNSA plans to wind down W88 Pit Manufacturing funding within Campaigns. (Pit manufacturing then is funded under Directed Stockpile Work beginning in FY2008, as per note b to Table 1.) W88 Pit Certification and Support Activities at NTS are reduced as W88 certification work is completed. The pit program will increasingly focus on developing technology to manufacture other pit types, which accounts for the ramp in Pit Manufacturing Capability funding, and on MPF, which increases substantially as work begins on an EIS on the selected site for MPF in FY2005 and conceptual design activities are expanded to prepare for the start of preliminary design in FY2007. (The schedule for MPF may change.)

Issues for Congress

This section highlights issues connected with the pit program, raises arguments and counterarguments for each issue, and presents under "prospects" the state of play for each issue or what currently appears to be the most likely outcome. Issues dealt with include pit certification; the need for new pits (beyond limited quantities for W88 warheads); if new pits are needed, what is the required capacity; how might that capacity be obtained, and how quickly could or should that be done.

Is NNSA's Plan for Certification Reasonable? *Yes:* To certify pits without nuclear testing, NNSA believes it must use much more sophisticated techniques than were used to certify Rocky Flats pits in order to rule out each plausible source of failure. *No:* In one view, only nuclear testing can assure that pits will work as intended on grounds that pits are sensitive to minor variations in process and materials, many potential unknowns exist, and computer models may not capture what we do not know. Others see the certification plan as excessive, claiming pits will work despite minor production variations. For decades, Los Alamos and Livermore technicians made many one-of-a-kind pits for testing. These pits did not meet war reserve standards but, as evidenced by the nuclear test record, a great many of them worked.⁶⁴ *Prospects:* Absent nuclear testing, the United States seems sure to use NNSA's plan to certify pits.

Does the United States Need New Pits (Beyond Limited Quantities for W88)? *Yes:* In one view, greater pit manufacturing capability is needed to hedge against uncertainty in pit life in order to ensure that the U.S. nuclear deterrent

⁶⁴ For an official unclassified record of U.S. nuclear tests, see U.S. Department of Energy. *United States Nuclear Tests, July 1945 Through September 1992*. DOE/NV-200 (Rev. 14), December 1994, viii + 97 p.

remains effective. Further, the international situation may require the United States to manufacture new-design warheads, including pits; pits in storage may prove unsuitable for these warheads because of design or aging. *No:* Some believe pits will deteriorate so slowly that a decision on MPF can be deferred for decades. Some see new types of warheads as undesirable because these warheads would imply that the United States was preparing to test, build, deploy, and threaten the use of nuclear weapons, so these critics reject the new-weapons argument as a rationale for new pits. Those who favor abolishing nuclear weapons would not produce these weapons or their components. *Prospects:* No one can be certain that NNSA will not need to manufacture pits at some future date, and at any rate NNSA will have a limited capacity to produce pits at PF-4. Accordingly, the need for some new pits is less at issue than are capacity, schedule, and the need for MPF.

If So, What Capacity Is Needed? *Low:* It is not clear that pits will fail for many decades, if ever, in the critics' view. PF-4 could replace the few pits without spares that are destroyed during surveillance. If new-design warheads are needed, small numbers might suffice, or NNSA might use spare pits for those warheads, or it might convert existing warheads for new missions without changing the nuclear explosive package. Multiple-shift operations at PF-4 would increase output somewhat if needed. Further, critics argue, proceeding with MPF would reduce funds for other stockpile stewardship programs. *Higher:* One study stated, "A paramount concern is the need to begin work now on an adequate plutonium pit production manufacturing capability, in order to hedge against the uncertainties in useful pit life and in the time required to establish a new production facility."⁶⁵ MPF, in this view, would guard against the failure of one or more types of pits and would enable ongoing replacement of pits to forestall problems from aging. It would permit fabrication of large numbers of new-design warheads. While a smaller stockpile might permit lower pit production capacity, there can be no assurance on future stockpile size. *Prospects:* The FY2004 energy and water development appropriations conference report required DOE and DOD to submit a report to Congress with the FY2005 budget request providing details on a stockpile plan supporting the Nuclear Weapons Stockpile Memorandum and stated it would be "premature" to pursue further decisions on MPF pending congressional review of the report. In a hearing before the House Armed Services Committee on March 18, 2004, NNSA Administrator Linton Brooks could not provide an estimate of the delivery date of the report. The report should help clarify stockpile size, giving some indication of required capacity. On the other hand, while the report will focus on the stockpile through 2012, the stockpile and required capacity could change substantially by 2021, when MPF is scheduled to begin full production operations. Thus capacity will be at issue for some time to come, and with it the fate of MPF.

Can NNSA Expand PF-4 to Build Enough Pits Without MPF? *Yes:* Critics of the current plan note that some areas of PF-4 are not used for pit manufacturing. Instead, they are used for fabricating plutonium-238 components for space probes, monitoring weapons components, and storing obsolete equipment from past plutonium R&D. Floor constraints make the layout of pit production equipment

⁶⁵ U.S. Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile. *FY 1999 Report*. November 8, 1999, letter of submittal.

less than ideal. Using all of PF-4 for pit production, arranging equipment more efficiently, and using multiple shifts might raise PF-4's capacity beyond 50 pits a year. By one estimate, if national security depended on boosting the rate and if Los Alamos had prepositioned the necessary production equipment, PF-4's capacity might reach 100 or more a year.⁶⁶ Further, some plutonium work could be consolidated, moved out of PF-4, or moved to Livermore's Superblock facility.⁶⁷ *No*: MPF's proponents note that PF-4 is the nation's main plutonium R&D facility. They hold that using it for production would interfere with R&D. NNSA holds that the maximum feasible capacity of PF-4 is 80 pits per year, that achieving this capacity would require major changes to plutonium work and considerable expense, and that adding 50 years to the life of PF-4, which would be 40 years old by the time that it could begin production at the new rate, may not be feasible.⁶⁸ Since MPF must proceed now if it is to provide a hedge against possible future needs, the question of expanding PF-4 is moot. *Prospects*: MPF's prospects appear unsettled. Without knowing pit life, future stockpile size, and required capacity, it cannot be determined conclusively if PF-4 would suffice, and such determination might not be possible for some years. On the other hand, PF-4 would not suffice if the dominant consideration is a desire to begin to hedge against a possible future need for a larger capacity than PF-4 could reasonably offer. Congressional approval of MPF is also uncertain. While the FY2004 National Defense Authorization Act provided the funding requested for the entire pit program, including MPF, the Energy and Water Development Appropriations Act cut MPF funding from \$22.8 million to \$10.8 million and the conferees, as noted, stated it was premature to pursue further decisions on MPF pending a report on the stockpile plan.

Could NNSA Accelerate MPF's Schedule? *Yes*: The NNSA report on MPF acceleration cited above presents various steps that it states could accelerate MPF by 3 to 4 years. *Yes, but*: Projects often take longer than anticipated, so net acceleration might be less than anticipated. If MPF acceleration were to delay other NNSA projects by drawing funds or managerial attention from them, it is not clear that the tradeoff would be worthwhile. *Prospects*: The NNSA report arguably moves the debate away from the feasibility of accelerating MPF toward the desirability of so doing. Ironically, if congressional actions delay MPF, and Congress were to subsequently decide to return to the original scheduled operating date, an accelerated schedule might be the only way to meet the original schedule.

Should Congress and the Administration Delay MPF's Schedule? *Yes*: Those who would delay MPF find little if any evidence that pits will deteriorate in ways that will require rebuilding of all pits of a given type, hundreds to thousands of units. Furthermore, international developments might lead to a smaller arsenal that PF-4 could support. It would be unwise, in their view, to spend billions on a facility that might well prove unneeded and that would support any future decision

⁶⁶ Mello, "No Need for a Large-Scale Pit Facility: Existing Los Alamos Facilities Are Adequate."

⁶⁷ Regarding consolidation or moving work out of PF-4, see *MPF EIS*, p. S-25. Regarding Superblock, see John Immele, "Perspectives," *Weapons Insider: A Publication of the [Los Alamos] Nuclear Weapons Program*, January-June 2002, p. 3.

⁶⁸ *MPF EIS*, p. S-24, S-25.

to proceed with development of new types of nuclear weapons. *No*: MPF's supporters believe uncertainties about plutonium aging and the international situation mean that the United States would be taking a big risk to delay proceeding with MPF. If events turn out unfavorably, an inability to make pits on a large scale could prove disastrous to U.S. security. *Hedge*: Instead of proceeding with or delaying MPF based on incomplete information, NNSA could proceed on the current track until 2012. By that time, that agency expects to complete the large volume of preconstruction work — EIS, site selection, planning, permitting, design, process development, etc. If at that time plutonium aging did not appear to be a problem, or if the stockpile were projected to shrink, or if fewer types of nuclear weapons were deployed, or the likelihood of using nuclear weapons had become more remote than at present, then the United States would, for a fraction of the cost of MPF, have purchased a hedge in case MPF needed to be built on the current schedule. Should such events turn out unfavorably, MPF could proceed to construction and operation with little or no loss of time. *Prospects*: In the short term, further delay of several months in submitting the DOD-DOE report on stockpile plans could lead Congress to delay MPF in the FY2005 budget cycle. In the longer term, for reasons noted earlier, prospects for acceleration or delay are both quite uncertain.

Table 4. Key Dates in NNSA's Proposal for the Pit Manufacturing and Certification Campaign

1989	Rocky Flats Plant produces its last pit
1992	DOE decides to close Rocky Flats Plant as a nuclear weapons production site.
September 1996	DOE issues final programmatic environmental impact statement (EIS) for stockpile stewardship and management
December 1996	DOE issues record of decision on stockpile stewardship and management that includes reestablishing pit production capability at Los Alamos and the prospect of a larger-capacity facility
May 2002	MPF: Secretary of Energy approves Critical Decision 0 (CD-0), approval of mission need
September 2002	NNSA informs Congress it intends to start conceptual design of MPF in 2003, and announces (<i>Federal Register</i> , Sept. 23, 2002: 59577-59580) it intends to prepare a supplemental programmatic EIS on stockpile stewardship and management for MPF
October 2002	MPF: NNSA holds public scoping meetings on supplemental EIS
Early FY2003	MPF: NNSA begins conceptual design
April 22, 2003	Los Alamos completes manufacture of the first certifiable W88 pit
May 2003	MPF: NNSA released draft EIS
June 26-July 16, 2003	MPF: Public meetings were held at potential MPF sites and in Washington, DC, to obtain comments on the draft EIS
FY2004	Los Alamos will manufacture 6 W88 qualification pits. At Nevada Test Site, NNSA will conduct 3 subcritical experiments.

Date to be determined; was to be 2004	MPF: Release final EIS
	MPF: Issue record of decision; if Secretary of Energy decides to proceed with MPF, select site
FY2005	If Secretary decides to proceed with MPF, begin site-specific EIS
FY2006	Complete currently planned subcritical experiments in support of W88 Pit Certification.
FY2007	MPF: Complete site-specific EIS. Obtain approval of CD-1, system requirements and alternatives and start of preliminary design. Los Alamos will certify the first W88 pit without nuclear testing. PF-4: achieve capacity to produce 10 to 20 W88 pits per year
FY2008	W88 Pit Manufacturing transitions from Campaigns to Directed Stockpile Work.
FY2009	MPF: Obtain approval of CD-2, start of final design. PF-4: establish the capability to manufacture B61-7 and B87 pits
FY2012	PF-4: manufacture development pits for B61-7 and W87
end FY2012	MPF: complete final design; CD-3 (authorize start of construction)
FY2018	MPF: CD-4 (approve start of operations)
FY2019	MPF: start building pits to check out operations
FY2021	MPF: start delivering war reserve pits; full-scale production

Note: Many entries for FY2004 and beyond are from Department of Energy, *FY 2005 Congressional Budget Request*, vol. 1, esp. p. 147-154. Some MPF entries before FY2004 are from U.S. Department of Energy. National Nuclear Security Administration. "Modern Pit Facility (MPF) Fact Sheet," October 2002, 2 p. See also "Project Schedule: Modern Pit Facility Project," *MPF EIS*, p. S-14. Both documents are available via [<http://www.mpfteis.com>]. NNSA pit project staff updated some information, March 3, 2004.